

Appl. No. : 10/757,178  
Filed : January 14, 2004

### AMENDMENTS TO THE CLAIMS

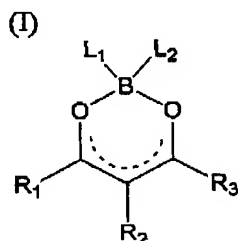
Please amend Claims 1 and 22 as follows and add new Claim 25 as follows:

1. (Currently amended) A composition comprising a polydioxaborine having a weight average molecular weight of about 1,000 or greater and an NLO chromophore.

2. (Original) The composition of Claim 1 that is photoconductive.

3. (Original) The composition of Claim 2 that is photorefractive.

4. (Original) The composition of Claim 1 in which the polydioxaborine comprises a dioxaborine group of the formula (I):



wherein R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, L<sub>1</sub> and L<sub>2</sub> are each independently selected from the group consisting of hydrogen, linking atom, electron withdrawing group, and electron donating group.

5. (Original) The composition of Claim 4 in which R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, L<sub>1</sub> and L<sub>2</sub> are each independently selected from the group consisting of a hydrogen atom, a linking atom, C<sub>1</sub>-C<sub>10</sub> alkyl, and C<sub>6</sub> - C<sub>10</sub> aryl.

6. (Original) The composition of Claim 4, in which

L<sub>1</sub> and L<sub>2</sub> are each independently selected from the group consisting of hydrogen, linking atom, halogen, C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>1</sub>-C<sub>6</sub> alkoxy, C<sub>1</sub>-C<sub>6</sub> thioalkyl, nitrile, and a bridging ligand formed by L<sub>1</sub> and L<sub>2</sub> together;

R<sub>1</sub> and R<sub>3</sub> are each independently selected from the group consisting of hydrogen, linking atom, carboxylate, carboxylic acid, aldehyde, amide, epoxy, acid chloride, anhydride, nitrile, sulfonate, sulfonic acid, phosphonate, nitrate, nitro, C<sub>1</sub>-C<sub>18</sub> alkoxy, C<sub>1</sub>-C<sub>18</sub> alkyl, C<sub>1</sub>-C<sub>18</sub> fluoroalkyl, hydroxyl, C<sub>12</sub>-C<sub>20</sub> diarylamino, C<sub>2</sub>-C<sub>10</sub> dialkylamino, C<sub>1</sub>-C<sub>6</sub>

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alkylhalide, C<sub>1</sub>-C<sub>6</sub> nitroalkyl, C<sub>1</sub>-C<sub>6</sub> alkanolic acid, C<sub>1</sub>-C<sub>6</sub> alkylamide, C<sub>6</sub>-C<sub>10</sub> aryl, C<sub>6</sub>-C<sub>10</sub> aryloxy, C<sub>7</sub>-C<sub>20</sub> alkylaryl, and C<sub>7</sub>-C<sub>20</sub> alkylaryloxy; and

R<sub>2</sub> is selected from the group consisting of hydrogen, linking atom, carboxylate, carboxylic acid, aldehyde, amide, epoxy, acid chloride, anhydride, nitrile, sulfonate, sulfonic acid, phosphonate, nitrate, nitro, C<sub>1</sub>-C<sub>18</sub> alkoxy, C<sub>1</sub>-C<sub>18</sub> alkyl, C<sub>1</sub>-C<sub>18</sub> fluoroalkyl, C<sub>12</sub>-C<sub>20</sub> diarylamino, C<sub>1</sub>-C<sub>6</sub> alkylhalide, C<sub>1</sub>-C<sub>6</sub> nitroalkyl, C<sub>1</sub>-C<sub>6</sub> alkanolic acid, C<sub>1</sub>-C<sub>6</sub> alkylamide, C<sub>7</sub>-C<sub>20</sub> alkylaryl, and C<sub>7</sub>-C<sub>20</sub> alkylaryloxy.

7. (Original) The composition of Claim 4 in which the linking atom is selected from the group consisting of carbon atom, nitrogen atom, oxygen atom, and sulfur atom.

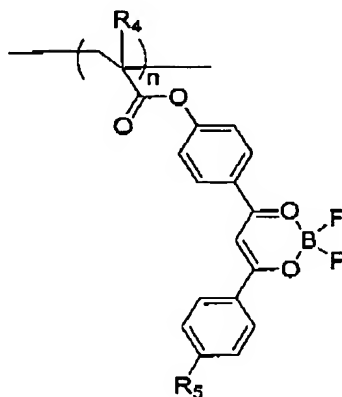
8. (Original) The composition of Claim 4 in which L<sub>1</sub> and L<sub>2</sub> are each independently a halogen selected from the group consisting of fluoro, chloro, and bromo; R<sub>1</sub> is a linking atom, R<sub>2</sub> is hydrogen, and R<sub>3</sub> is selected from the group consisting of hydrogen, C<sub>1</sub>-C<sub>18</sub> alkyl, C<sub>1</sub>-C<sub>18</sub> alkoxy, C<sub>6</sub>-C<sub>10</sub> aryl, C<sub>6</sub>-C<sub>10</sub> aryloxy, C<sub>7</sub>-C<sub>20</sub> alkylaryl, and C<sub>7</sub>-C<sub>20</sub> alkylaryloxy.

9. (Original) The composition of Claim 4 in which only one of R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, L<sub>1</sub> and L<sub>2</sub> is a linking atom.

10. (Original) The composition of Claim 4 in which two of R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, L<sub>1</sub> and L<sub>2</sub> are linking atoms.

11. (Original) The composition of Claim 1 in which the polydioxaborine comprises a recurring unit of the formula (II)

(II)

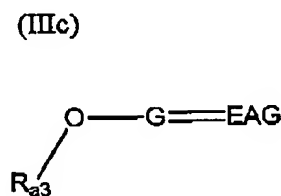
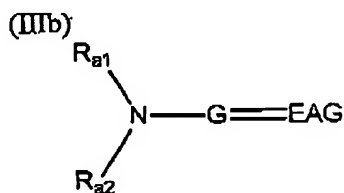
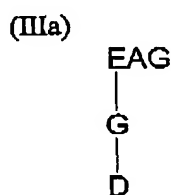


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in which  $R_4$  and  $R_5$  are each independently selected from the group consisting of a hydrogen atom,  $C_1$ - $C_{10}$  alkyl, and  $C_6$  -  $C_{10}$  aryl.

12. (Original) The composition of Claim 1 in which the NLO chromophore has a photorefractive figure of merit of about  $1 \times 10^{-49}$  esu or greater.

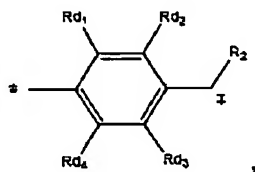
13. (Original) The composition of Claim 12 in which the NLO chromophore is a compound having a formula selected from the group consisting of formula (IIIa), formula (IIIb), and formula (IIIc):



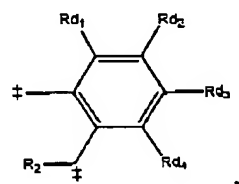
in which  $R_{a1}$ ,  $R_{a2}$ , and  $R_{a3}$  are each individually selected from the group consisting of a hydrogen atom,  $C_1$ - $C_{10}$  alkyl, and  $C_6$  -  $C_{10}$  aryl; G is a  $\pi$ -conjugated bridge; and EAG is an electron acceptor group.

14. (Original) The composition of Claim 13 in which G is represented by a structure selected from the group consisting of an alkene, a 1,3-diene, a 1,3,5 triene, a structure of the formula (V), a structure of the formula (VI), and a structure of the formula (VII);

(V)

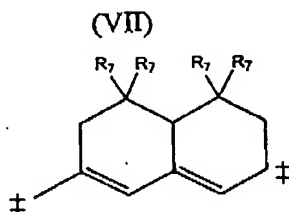


(VI)



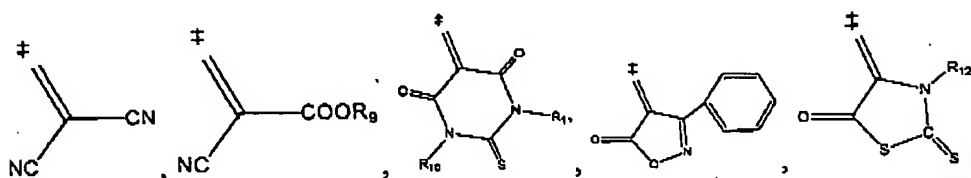
wherein  $Rd_1$ - $Rd_4$  are each independently selected from the group consisting of a hydrogen atom,  $C_1$ - $C_{10}$  alkyl, and  $C_6$  -  $C_{10}$  aryl;

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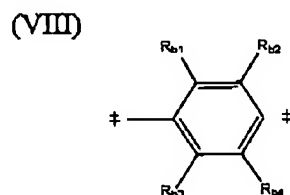
wherein R<sub>7</sub> represents H or C<sub>1</sub>-C<sub>10</sub> alkyl; and

wherein EAG is an electron acceptor group represented by a structure selected from the group consisting of



wherein R<sub>9</sub>, R<sub>10</sub>, R<sub>11</sub>, and R<sub>12</sub> are each independently selected from the group consisting of a hydrogen atom, C<sub>1</sub>-C<sub>10</sub> alkyl, and C<sub>6</sub> - C<sub>10</sub> aryl.

15. (Original) The composition of Claim 13 in which G in formula (IIIa) is represented by the formula (VIII):



wherein EAG is selected from the group consisting of SO<sub>3</sub>R<sub>13</sub>, NO<sub>2</sub>, C(O)OR<sub>13</sub>, SO<sub>2</sub>R<sub>13</sub>, S(O)R<sub>13</sub>, C(O)R<sub>13</sub>, CN, and C(O)NR<sub>14</sub>R<sub>15</sub>, in which C(O) represents a carbonyl group and S(O) represents a sulfoxide group; and

wherein R<sub>b1</sub>, R<sub>b2</sub>, R<sub>b3</sub>, R<sub>b4</sub>, R<sub>b5</sub>, R<sub>13</sub>, R<sub>14</sub>, and R<sub>15</sub> are each independently selected from the group consisting of a hydrogen atom, C<sub>1</sub>-C<sub>10</sub> alkyl, and C<sub>6</sub> - C<sub>10</sub> aryl.

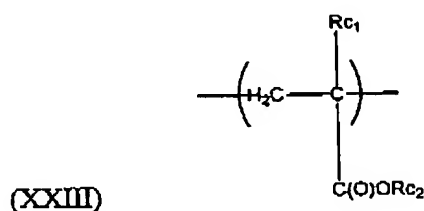
16. (Original) The composition of Claim 14 in which the NLO chromophore is (4-(homopiperidiny)benzylidene)malonitrile.

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17. (Original) The composition of Claim 12 in which the NLO chromophore is covalently bonded to the polydioxaborine.

18. (Original) The composition of Claim 1 in which the polydioxaborine comprises a plasticizing recurring unit.

19. (Original) The composition of Claim 18 in which the plasticizing recurring unit is represented by the formula (XXIII):



wherein Rc<sub>1</sub> and Rc<sub>2</sub> are independently selected from the group consisting of C<sub>1</sub>-C<sub>10</sub> alkyl and C<sub>1</sub> - C<sub>10</sub> alkenyl.

20. (Original) The composition of Claim 19 in which (XXIII) is selected from the group consisting of 2-ethylhexylacrylate, butylacrylate, and butylmethacrylate.

21. (Original) The composition of Claim 20 having a glass transition temperature of about 100° C or less.

22. (Currently amended) A composition comprising a polydioxaborine having a weight average molecular weight of about 1,000 or greater, an NLO chromophore and a photosensitizer.

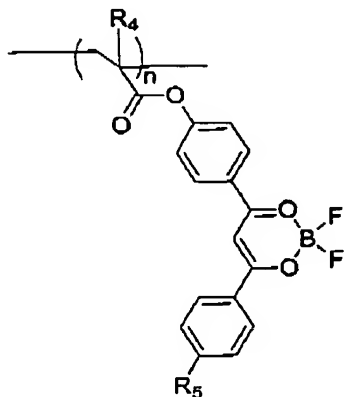
23. (Original) The composition of Claim 22 in which the photosensitizer is a charge-transfer complex.

24. (Original) The composition of Claim 23 in which the charge-transfer is formed between at least a part of the NLO chromophore and the polydioxaborine.

25. (New) A composition comprising a polydioxaborine and an NLO chromophore, wherein the polydioxaborine comprises a recurring unit of the formula (II):

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(II)



in which  $R_4$  and  $R_5$  are each independently selected from the group consisting of a hydrogen atom,  $C_1$ - $C_{10}$  alkyl, and  $C_6$  -  $C_{10}$  aryl.